Patent Claims

1. Process for the preparation of polynucleotides, comprising the following steps:

a) Reaction of the free 5′-hydroxy group of a selected oligonucleotide, whose terminal 3'- hydroxy group contains a usual suitable protecting group, derivatized in a previous step to a phosphite amidoester, phosphotriester or phosphonic acid ester, which is a 3'-hydroxy group of a free or solid phase bound polynucleotide or a solid phase bound hydroxy group, under suitable conditions and purification of the reaction product if necessary.

b) if necessary oxidation of the reaction product according step a) to a phosphodiester or phosphotriester, if a hydroxy group derivatized to a phosphite amidoester was used and purification of the reaction product if necessary.

c) Removal of the 3′-hydroxy protecting group of the reaction product according steps a) or b) under usual suitable conditions and purification of the reaction product if necessary.

d) Derivatization of the free 3′-hydroxy group to a phosphite amidoester phosphotriester or phosphonic acid ester by using usual suitable reagents,

e) if necessary rerun of steps a) to c) by using the activated reaction product according to step d),
whereby the oligonucleotides with the free 5′-hydroxy group according to step a) are always selected in such way, that the desired polynucleotide is obtained.

2. Process according to claim 1, comprising steps a) to c), characterized in that the 5′-hydroxy group of the selected oligonucleotide is a phosphite amidoester or phosphonic acid ester and is reacted with the free 3′-hydroxy group of a free or solid phase bound polynucleotide or with the hydroxy group of a solid phase in step a).

3. Process according to claim 1 or 2, characterized in that the selected oligonucleotide is a pentanucleotide, preferably a tetranucleotide, especially preferred a trinucleotide and exceptionally a dinucleotide.

4. Process according to one of the claims 1 to 3, characterized in that the protecting group of the 3′-hydroxy group of the selected oligonucleotide is a photolabile protecting group, preferably a photolabile protecting group selected from the group NPPOC, MeNPOC, NVOC, PyMOC, NBOC, NPES, NPPS.

5. Process according to claim 1 to 4, characterized in that in addition to the selected oligonucleotides, also selected and correspondingly derivatized mononucleosides are used.

6. Process according to one of the claims 1 to 5, characterized in that the compounds, which have a hydroxy group derivatized as phosphite amidoester, phosphotriester or phosphonic acid ester, are solid phase bound, whereby the solid phase is selected from the group silica gel, glass, metal, preferably magnetic metal, plastic, cellulose, dextrane crosslinked with epichlorohydrine, agarose, styrene-divinylbenzene resin, or chloromethylated co-polystyrene-divinylbenzene resin.

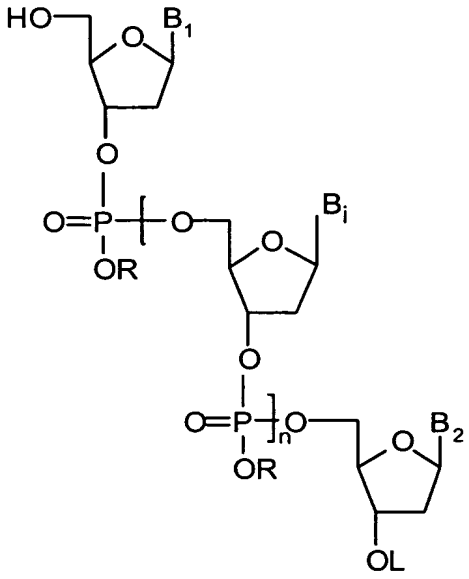
7. Process according to claim 6, characterized in that the nucleotides according to claims 1 to 5 are covalently bound to the solid phase via linker molecules.

8. Process according to one of the claims 1 to 7, characterized in that the polynucleotides are DNA- or RNA-nucleotides or polynucleotides made from nucleic acid analogs, as PNA, LNA or chimeras from them with DNA, RNA or nucleic acid analogs.

9. Process according claim 1 to 8, characterized in that the steps are performed within an automated process.

10. Process according to claim 9, characterized in that the automated process is designed as parallel synthesis to the creation of a nucleotide library, where the selected oligonucleotides and if necessary some more mononucleotides are selected specifically or at random.

11. Nucleotide derivative according to the general formula (L)



(L)

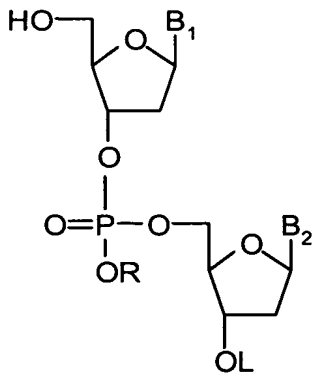
, where B_1, B_2, B_i can be H, adeninyl, cytosinyl, guaninyl, thyminyl, uracilyl, 2,6-diaminopurine-9-yl, hypoxanthine-9-yl, 5-methylcytosine-1-yl, 5-amino-4-carboxylimidazol-1-yl or 5-amino-4-carbamoylimidazol-1-yl independently from each other, where in the case of B_1, B_2, B_i having primary amino functions, these may have a permanent protecting group, resp. with thyminyl or uracilyl at the O_4-position these can have a permanent protecting group if necessary,

where R can be an H, alkyl, cycloalkyl, aryl, aralkyl, cyanoalkyl, haloalkyl rest,

and where L stands for NPPOC, FMOC and NPC,

and n = 0 or is an integer from 1 to 4.

12. Nucleotide derivatives with the general formula (E):



(E)

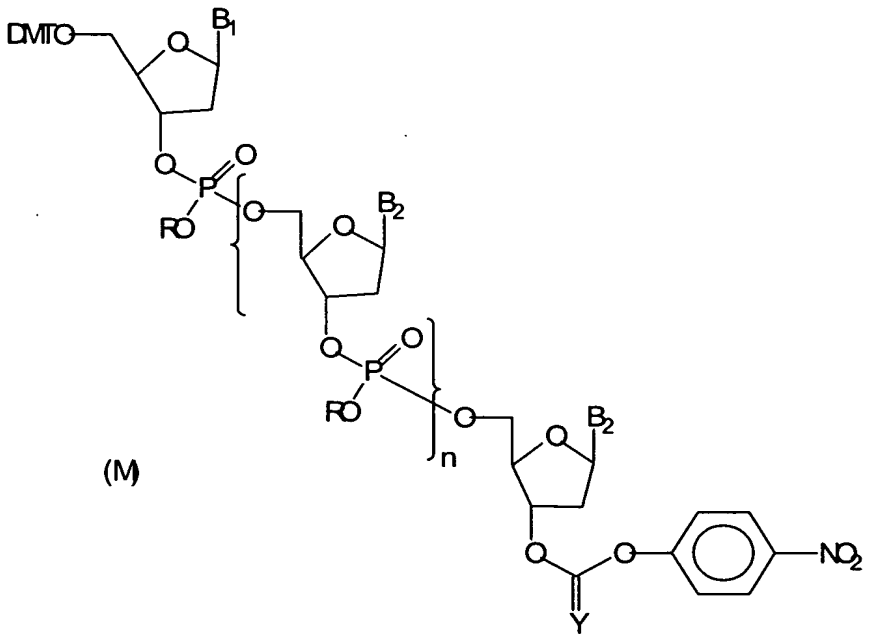
, where B_1 and B_2 can be H, adeninyl, cytosinyl, guaninyl, thyminyl, uracilyl, 2,6-diaminopurine-9-yl, hypoxanthine-9-yl, 5-methylcytosine-1-yl, 5-amino-4-caboxylimidazol-1-yl or 5-amino-4-carbamoylimidazol-1-yl independently from each other, where in the case of B1, B_2 having primary amino functions these may have a permanent protecting group resp. with thyminyl or uracilyl a the O_4-position, these may have a permanent protecting group if necessary.

where R can be an H, alkyl, cycloalkyl, aryl, aralkyl, haloalkyl, cyanoalkyl rest,

and where L stands for NPPOC, FMOC and NPC.

13. Use of a nucleotide derivative according to claim 11 and/or 12 in a process according to one of the claims 1 to 10.

14. Nucleotide derivative with the general formula M



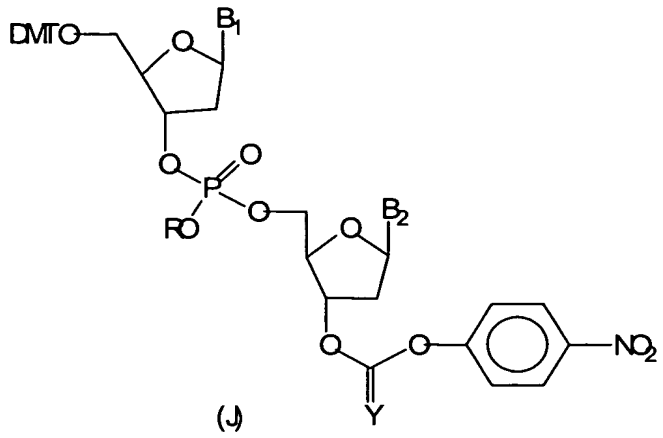
(M)

, where B_1, B_2, B_i can be adeninyl, cytosinyl, guaninyl, thyminyl, uracilyl, 2,6-diaminopurine-9-yl, hypoxanthine-9-yl, 5-methylcytosine-1-yl, 5-amino-4-carboxylimidazol-1-yl or 5-Amino-4-carbamoylimidazol-1-yl independently from each other, where in the case of B_1, B_2, B_i having primary amino functions, these may have a permanent protecting group resp. with thyminyl or uracilyl at the O_4-position, these may have a permanent protecting group, if necessary,

where can be an H, an alkyl, cycloalkyl, aryl, aralkyl, haloalkyl, cyanoalkyl rest,

and Y = O or S and n = 0 or an integer from 1 to 4.

15. Nucleotide derivative with the general formula (J)



(J)

, where B_1 and B_2 can be adeninyl, cytosinyl, guaninyl, thyminyl, uracilyl, 2,6-diaminopurine-9-yl, hypoxanthine-9-yl, 5-methylcytosine-1-yl, 5-amino-4-caboxylimidazol-1-yl or 5-amino-4-carbamoylimidazol-1-yl independently from each other, where in the case of B_1, B_2 having primary amino functions, these may have a permanent protecting group resp. with thyminyl or uracilyl at the O_4-position, these may have a permanent protecting group, if necessary,

where R can be H, an alkyl, cycloalkyl, aryl, aralkyl, haloalkyl, cyanoalkyl rest,

and Y = O or S.

16. Use of a nucleotide derivative according to claim 14 and/or 15 in a process according to one of the claims 1 to 10.

17. Kit, which contains part of or all reagents and/or auxiliaries, especially the nucleotide derivatives (E) and/or (J) and/or (L) resp. (M) and/or solvents and/or a work

instruction for carrying out a process according to one of the claims 1 to 10 in one unit, characterized in that the kit contains at least one or more selected oligonucleotide(s), especially the nucleotide derivatives (E) and/or (J), which have a free 5′-hydroxy group and a protected 3′-hydroxy group and/or a suitable reagent for the introduction of the phosphate group.

18. Use of a process according to one of the claims 1 to 10 and/or a kit according to claim 17 for the preparation of oligonucleotides or nucleic acid chips.

19. Use of a process according to one of the claims 1 to 10 and/or a kit according to claim 17 for the automated preparation of oligonucleotides or nucleic acid chips.